METHODS AND APPARATUS FOR WIRELESS NETWORKING

TECHNICAL FIELD

[0001] The present invention relates generally to wireless communication. More particularly, the invention relates to improved systems and techniques for use of contention free periods in wireless local area networking.

BACKGROUND

[0002] Wireless networking has become more and more popular in recent years. Wireless deployments allow users convenience in choosing their location, and free movement within the area of service, without a need to find or connect to a wired outlet. In addition, users can enter or leave an area of service without any need to physically connect or disconnect.

[0003] Because of the popularity of wireless networking and the ease of setting up wireless networks (in addition to the sensitivity of much of the information that is carried by such networks, independently operated networks proliferate in many locations, with many independent networks operating in close proximity to one another. Network access points come in all varieties, operating at different power levels and having different ranges, and they all must share available radio resources. In any but sparsely populated areas, significant numbers of access points and client devices may be expected to be within range of one another, and standards for wireless networking operation provide mechanisms for orderly sharing of frequency resources.

SUMMARY

[0004] In one embodiment of the invention, an apparatus comprises at least one processor and memory storing a program of instructions. The memory storing the program of instructions is configured to, with the at least one processor, cause the apparatus to at least, before the beginning of a priority period, examine a transmission medium for an ongoing transmission from a second apparatus and, in response to detection of an ongoing transmission extending past the scheduled beginning of the priority period, wait for the fulfillment of a specified criterion indicating an end of the ongoing transmission. In response to fulfillment of the specified criterion, transmission of a first data frame is scheduled followed by a first interframe space value during the priority period. During a non-priority period, transmission of a first data frame is scheduled after an ongoing transmission followed by a second interframe space value, wherein the second interframe space value is greater than the first interframe space value.

[0005] In another embodiment of the invention, a method comprises, before the beginning of a priority period, examining a transmission medium for an ongoing transmission and, in response to detection of an ongoing transmission from a second apparatus extending past the scheduled beginning of the priority period, waiting for the fulfillment of a specified criterion indicating an end of the ongoing transmission. In response to fulfillment of the specified criterion, transmission of a first data frame is scheduled, followed by a first interframe space value during the priority period. During a non-priority period, transmission of a first data frame is scheduled, followed by a second interframe space value, wherein the second interframe space value is greater than the first interframe space value.

[0006] In another embodiment of the invention, a computer readable medium stores a program of instructions, execution of which by a processor configures an apparatus to at least, before the beginning of a priority period, examine a transmission medium for an ongoing transmission from a second apparatus and, in response to detection of an ongoing transmission extending past the scheduled beginning of the priority period, wait for the fulfillment of a specified criterion indicating an end of the ongoing transmission. In response to fulfillment of the specified criterion, transmission of a first data frame is scheduled, followed by a first interframe space value during the priority period. During a non-priority period, transmission of a first data frame is scheduled, followed by a second interframe space value, wherein the second interframe space value is greater than the first interframe space value.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. **1** illustrates a network environment according to an embodiment of the present invention;

[0008] FIG. **2** illustrates a signaling diagram according to an embodiment of the present invention;

[0009] FIG. **3** illustrates a process according to an embodiment of the present invention; and

[0010] FIG. **4** illustrates elements used in carrying out one or more embodiments of the present invention.

DETAILED DESCRIPTION

[0011] Embodiments of the present invention recognize that development of new network technologies is generally achieved in an incremental fashion, leading to a need for networks, systems, and devices developed using newer technologies or following newer standards to coexist with existing legacy networks, systems, and devices using older technologies or following an older standard. One need for coexistence that has been recognized is the need for priority or contention free transmission to coexist with existing networks that use contention based transmission at least part of the time.

[0012] One particular exemplary embodiment addresses coexistence of networks using a contention free period with legacy wireless networks operating under various divisions of the 802.11 standard, at least some of which do not recognize contention free periods. At least some such networks use Carrier Sense Multiple Access, and this limits the number of concurrent transmissions that can take place in a dense deployment. Embodiments of the invention further recognize that widespread, organized changes to networks deployments are virtually impossible, because networks are generally implemented by individuals or small groups to meet their own needs and changes to existing deployments will occur only incrementally as network owners perceive that new implementations will better meet their needs. It is recognized, therefore, that new mechanisms for wireless networking may need to be compatible with existing mechanisms.

[0013] In one or more embodiments therefore, the present invention addresses mechanisms to be used in deployments of high efficiency wireless LAN (HEW) networks so that such HEW networks will be compatible with existing WLAN operating under earlier 802.11 standards. As currently being developed, HEW may use periodic priority periods, such as contention free (CF) periods, to increase wireless medium utilization. At other times, the HEW networks may use non-priority periods, such as contention periods, to allow legacy